

CLAIMS

What is claimed is:

1. A surgical instrument navigation system, comprising:
 - a surgical instrument;
 - an imaging device operable to capture image data representative of a patient;
 - a tracking subsystem operable to capture in real-time position data indicative of the position of the surgical instrument;
 - a data processor adapted to receive image data from the imaging device and position data from the tracking subsystem, the data processor being operable to generate a three-dimensional representation of the surgical instrument as it would visually appear from either of at least two different perspectives and to overlay the representation of the surgical instrument onto the image data of the patient; and
 - a display in data communication with the data processor, the display being operable to display the representation of the surgical instrument superimposed onto the image data of the patient.

2. The surgical instrument navigation system of Claim 1 wherein the processor is further operable to track in real-time the position of the surgical instrument as it is moved by a surgeon and generate a corresponding representation of the surgical instrument in relation to the image data of the patient.

perspective
inversion

Surgey

600/427

compatible
with
therapy

425

tomography
imaging

407
nuclear
diagnostic
ultrasound

250/

600 424
427
411

Next to the

16/05/2008

to priority

File Date

2-28-2009

a patient:

102

Patent
surgical
6/29/2008

3. The surgical instrument navigation system of Claim 1 wherein the imaging device is further defined as a rotatable C-arm, such that at least one of the two different perspectives is determined by an orientation of the C-arm in relation to the patient.

Atg

4, 582, 990

4. The surgical instrument navigation system of Claim 1 wherein the imaging device further includes an image source emanating radiation towards the patient and an image receiver positioned to receive radiation from the image source, such that the generated representation of the surgical instrument visually appears as it would from either the perspective of the image source or the perspective of the image receiver.

102

5. The surgical instrument navigation system of Claim 1 wherein the generated representation of the surgical instrument visually appears from a perspective that is selectable by a user of the navigation system.

102

~~LAB~~

6. The surgical instrument navigation system of Claim 5 wherein the display further includes a touch screen activated button operable to select the perspective of the generated representation of the surgical instrument.

4, 621, 257
Touch
Screen

~~LAB~~
No

7. The surgical instrument navigation system of Claim 1 wherein the display visually indicates the perspective of the generated representation of the surgical instrument as it appears to a user of the navigation system.

2

8. The surgical instrument navigation system of Claim 1 wherein the imaging device is selected from the group consisting of x-ray imaging device, computed tomography imaging device and magnetic resonance imaging device.

102

9. The surgical instrument navigation system of Claim 1 wherein the tracking subsystem employs a non-contact positional location technique that is based on at least one of radio waves, infrared waves, magnetic fields, or sonic emissions.

182

10. A surgical instrument navigation system, comprising:

a surgical instrument;

an imaging device operable to capture image data representative of a patient, the imaging device including an image source emanating radiation towards the patient and an image receiver positioned to receive radiation from the image source;

a tracking subsystem operable to capture in real-time position data indicative of the position of the surgical instrument;

a data processor adapted to receive image data from the imaging device and position data from the tracking subsystem, the data processor being operable to generate a three-dimensional representation of the surgical instrument as it would visually appear from either the perspective of the image source or the perspective of the image receiver and to overlay the representation of the surgical instrument onto the image data of the patient; and

a display in data communication with the data processor, the display being operable to display the representation of the surgical instrument superimposed onto the image data of the patient.

102

11. The surgical instrument navigation system of Claim 10 wherein the processor is further operable to track in real-time the position of the surgical instrument as it is moved by a surgeon and generate a corresponding representation of the surgical instrument in relation to the image data of the patient

103

② 12. The surgical instrument navigation system of Claim 10 wherein the generated representation of the surgical instrument visually appears from a perspective that is selectable by a user of the navigation system.

102

13. The surgical instrument navigation system of Claim 12 wherein the display is further defined as a graphical user interface having a touch screen activated button to select the perspective of the generated representation of the surgical instrument.

101

14. The surgical instrument navigation system of Claim 10 wherein the imaging device is selected from the group consisting of x-ray imaging device, computed tomography imaging device and magnetic resonance imaging device.

102

15. The surgical instrument navigation system of Claim 10 wherein the tracking subsystem employs a non-contact positional location technique that is based on at least one of radio waves, infrared waves, magnetic fields, or sonic emissions.

102

16. A method for displaying a virtual representation of a surgical instrument using a surgical instrument navigation system, comprising:

capturing image data representative of a patient using an imaging device;

rendering a three-dimensional representation of the surgical instrument as it would visually appear from a first perspective;

displaying the representation of the surgical instrument superimposed onto the image data of the patient; and

subsequently displaying the representation of the surgical instrument as it would visually appear from a second perspective that is selectable by an operator of the surgical instrument navigation system.

17. The method of Claim 16 further comprises capturing in real-time position data indicative of the position of the surgical instrument and displaying the representation of the surgical instrument superimposed onto the image data of the patient in accordance with the position data for the surgical instrument.

18. The method of Claim 16 wherein the step of subsequently displaying the representation of the surgical instrument further comprises selecting a perspective from which to view the representation of the surgical instrument; rendering a representation of the surgical instrument in accordance with the selected perspective; and displaying the representation of the surgical instrument superimposed onto the image data of the patient.